PREHISTORIC MAN IN AMERICA.

No subject in recent times has developed a larger or more active class of workers, or can lay claim to a more voluminous series of publications, than that pertaining to prehistoric man. Every nation working in science has added its contributors, and these contributors have generally been drawn from a class already trained in methods of scientific research.

So rapid has been the growth of the study of prehistoric man, that every student recalls its infancy, and its advance to a vigorous science. He remembers the dread experienced at the thought of impeaching the clearly defined record of Genesis, and he recalls with impatience how long it was before the evidence which had been gathering for a century could command a hearing. Collections had been slowly accumulating, though lying dormant and dusty on museum shelves, and their records, unpublished, suddenly came into notice, and with a prodigality of material and data in numberless hands, the elements were ready out of which rose the new science of archæology.

So fully imbued were men's minds with the idea of the recent and historical origin of the human race, that no possible interest could be excited in what purported to be the evidences of a pre-adamite people. In vain did archæologists offer their evidences of the high antiquity of man. Their discoveries were treated with incredulity, and their arguments rejected as worthless. A memoir read by Mr. Vivian before the Geological Society of London was considered too improbable for publication. The massive authority of Cuvier, who denied the possibility of man's existence anterior to those animals which live to-day, prevented the acceptance of Dr. Schmerling's remarkable discoveries in the Belgium caves.

Unquestioned acceptance of the Mosaic cosmogony has not only prevented the earlier development of this science, but it has caused the loss of a mass of evidence which can never be restored. Discoveries have been suppressed, false interpretations have been put upon others, valuable material has been ignored or lost, and in one way and another the study of man's early existence has been thwarted up to very recent years.

The sudden and wonderful growth of the study of man's high antiquity has been wholly due, not to the evidences,—for these had been despairingly thrust before the learned societies to be again and again rejected,—but to the rapid acceptance of those rational views which recognize man's origin from the animals below him.

Once it came to be fully believed that man was not only a mammal in the sense that systematists had recognized him to be, but a species of mammal among hundreds of other mammals, who, with them, had some common ancestry, and the study of archæology assumed the rank of an inductive science. A short time has seen the formation of imposing societies, many of them highly endowed; of magnificent museums, devoted exclusively to the preservation and exhibition of objects pertaining to this science; the publication of anthropological journals and transactions, and, above all, the production of a large number of popular illustrated works, which bring the science to the comprehension of the general reader.

It is quite necessary to understand all this to comprehend the amazing growth of a study which should have interested the race centuries ago. At the outset, the term prehistoric man was looked upon as applying to a people who lived before the dawn of recorded history—a people who lived, not in any hypothetical Eden, but, among other places, in the valleys of France and the caves of Belgium and England.

So limited was his area, and so apparently similar were all his rude characteristics, that for a time no further subdivision was necessary. A few years ago, comparatively speaking, his high antiquity and wide distribution over the face of the earth was not dreamed of. No account was taken of any possible geological changes having occurred since his appearance. It was enough to assert, with more or less positiveness, that his remains were synchronous with those of a few extinct species of mammals. That the contours of the land and ocean boundaries were

essentially the same for prehistoric man as for his historic descendants, could not for a moment be doubted. That during man's early reign the English Channel and Irish Sea had no existence, and an uninterrupted sweep of forest extended from the regions of Paris and London and across and beyond Ireland, far out to the present one-hundred-fathom line, no one dreamed of conceiving.

In the light of this knowledge, it is instructive to quote Dr. Wilson's words in his "Prehistoric Annals of Scotland." In reference to the Scottish aboriginal traces he says: "There is one certain point in this inquiry into primitive arts which the British antiquary possesses over all others, and from which he can start without fear of error. From our insular position it is unquestionable that the first colonist of the British Isles must have been able to construct some kind of a boat, and have possessed sufficient knowledge of navigation to steer his course through the open sea." Such were the positive and emphatic utterances of a writer who, in his recent valuable work on prehistoric man, in referring to this very passage confesses that this was no certain postulate after all, and who recognizes the profound geological changes which have taken place since paleolithic man first chipped the rude stone celts whose imperishable characters give us our only clue to his existence.

The hypothesis of geological changes of any magnitude being excluded, it was impossible at that time to grasp the true import of rude chipped flints deeply buried in river-gravel. Just as soon as the early remains could be looked upon as veritable fossils,—the name sounded so ancient,—to be studied in precisely the same way, and with the application of the same methods of reasoning as were brought to bear upon the remains of a paleotherium from the tertiary, or upon an ammonite from the Jura, then, and not till then, could his high antiquity be realized. And not until rude stone implements from the river-gravels and similar deposits were brought to light in France, Portugal, Germany, Brazil, India, New Jersey, and other widely separated countries, was the inconceivably long duration of man upon the earth acknowledged. The recognition of these evidences has been, and is at this time, hampered and retarded by a rigid and almost ridiculous scrutiny of every object bearing upon this subject. The study of other fossil mammals goes on unimpeded. Professors Marsh and Cope

collect their fossils and assign them to their proper geological horizons unchallenged save by the hostile Indian. The archæologist, on the contrary, has (for his best good it must be confessed) standing over him one set of critics, generally theological, who deny his facts, or call his evidences spurious. He is belabored by another set, generally theological also, who claim for man peculiarities which separate him from all considerations which would apply to other mammals below him. By another set still, who, ignoring the doctrine of probabilities, are ready to call every skull, or other remains showing quadrumanous features, abnormal or pathological. Thus, the ape-like skull of the Neanderthal cave was looked upon as a synostotic cranium. The extreme improbability that, in these frequently occurring and widely distributed cases, only idiotic or abnormal forms should come to light, never seems to trouble these critics.

While the general acceptance of the theory of man's origin from the lower animals has induced the present activity in archæological research, it is equally true that the study has contributed valuable evidence to the general correctness of Darwin's views.

The divisions of the tertiary, though artificial, are recognized by the varying percentages of the species of mollusks which are now extinct. If we are fortunate enough to get the remains of the very early man—not his works, but his bones—we shall, in the same way, estimate his degree of savagery and bestial features, and, possibly, his age, by the proportion of those characters which are not only outgrown by man at the present day, but which bring the widely diverging lines of man and the apes a little closer.

Now, as we have to do with the remains of man, not in the beds of the tertiary, where superposition is well established, but with his remains found in modified drift, river-gravels, and other rocks, whose age and synchronism are so difficult to establish, it would seem that here the trained osteologist must take up the investigation.

The recognized sequence of rude stone implements, polished implements, bronze, and iron, while holding good for limited areas, becomes of less value for larger fields when it is known that tribes with rude stone implements are existing to-day. A few hundred years ago the European combated with gunpowder the inhabitants of a vast continent who belonged to the neolithic age.

It is assumed by archæologists of great repute that since, in Europe, pleistocene deposits have yielded only the rudest of worked stone, therefore in no deposits older than the pleistocene can we expect to find evidences of a more primitive workmanship. This postulate may be admitted in regard to certain parts of Europe, for nothing more primitive than the rude celts can be imagined. Before this time, man, in that region at least, must have used natural fragments of stone and sticks, and even the faculty to use these indicates an advance far above his progenitors, who had not yet acquired this facility.

It is again assumed that since man is the most highly specialized mammal, it is not conceivable that he could have lived in the upper and middle tertiaries, because, of a large number of mammals living at that time, the species, and lower down the genera and families, are extinct; and, therefore, man, so far above these in organization, must have come in at a later date. On the other hand, it does not seem improbable that the single living species of man may be the sole survivor of a number of fossil species, and even genera, now extinct. Such a condition of things would find its parallel in many, if not in all, of the living species of mammals to-day who represent the survivors of a line of species and genera far back in the tertiary.

In regard to the other assumption—that man is the most highly specialized mammal—we think even this is open to suggestive doubt. In that he possesses a highly convoluted brain, with all its capabilities and possibilities as we find him to-day, he certainly is highly specialized; but as a mammal—and only as a mammal must we regard him—he belongs to a more generalized type. If we consider him only in relation to those mammals nearest related to him, we find all his characters held by no one ape, and to find his resemblances one has to consult a variety of forms. His structural relations are found in the gorilla, chimpanzee, orang, gibbon, *Simiadæ*, and even in the half-apes, the lemuroids. It is true that most of his resemblances are with the higher apes, but these are not of sufficient weight to assure us that any of them are his progenitors. Indeed, if we care to credit such high authorities as Mortillet, Dr. Hamy, and others, man existed in the middle miocene associated with the first anthropoid ape, *Dryopithicus*, and in later beds still with *Oreopithicus*, which, according to Gervais, had affinities with the anthropoid apes, macaques, and baboons.

Professor Cope, in considering man's relations to the tertiary mammals, says that "the mammals of the lower eocene exhibit a greater percentage of types that walk on the soles of their feet, while the successive periods exhibit an increasing number of those that walk on the toes, while the hoofed animals and carnivora of recent times nearly all have the heel high in the air, the principal exceptions being the elephant and bear families." He then goes on to show the successive osteological changes of the foot from the earlier types to the later ones, through several lines of descent, and says: "The relation of man to this history is highly interesting. Thus, in all generalized points, his limbs are those of a primitive type so common in the eocene. He is plantigrade; has five toes; separate tarsals and carpals; short heel; flat astragalus, and neither hoofs nor claws, but something between the two; the bones of the forearm and leg are not so unequal as in the higher types, and remain entirely distinct from each other, and the ankle joint is not so perfect as in many of them. In his teeth his character is thoroughly primitive. . . . His structural superiority consists solely in the complexity and size of the brain. A very important lesson is derived from these and kindred facts. The monkeys were anticipated in the greater fields of the world's activity by more powerful rivals. The ancestors of the ungulates held the fields and the swamps, and the carnivora, driven by hunger, learned the arts and cruelties of the chase. The weaker ancestors of the quadrumana possessed neither speed nor weapons of offense or defense, and nothing but an arboreal life was left them, when they developed the prehensile powers of the feet. Their digestive system unspecialized, their food various, their life the price of ceaseless vigilance, no wonder that their inquisitiveness and wakefulness were stimulated and developed, which is the condition of progressive intelligence"; and adding that "the race has not been to the swift, nor the battle to the strong," Professor Cope shows in this case that "the survival of the fittest has been the survival of the most intelligent, and natural selection proves to be, in the highest animal phase, intelligent selection."

Mr. Fiske shows, in another way, that when variations in intelligence became more important than variations in physical structure, they were seized upon, to the relative exclusion of the latter.

The earliest evidences of man must be sought for in his remains, for he must have existed in much the same condition many ages before the use of rude stone implements gave him any advantage in the struggle for life. These evidences have never been found. When man acquired the habit of seeking the shelter of caverns, or the custom of burying in sepulchers, then it became possible to preserve his remains for future generations to study; but outside of these fortunate receptacles, his remains have been rarely met with. The probable habits of primitive man and his progenitors were of such a character as to render the preservation of his remains one of extreme improbability.

The herbivora, roaming in immense herds, fording streams, and seeking shelter from the flies and heat in watery places, where, if they died, all the conditions for the preservation of their remains might be expected; the amphibious mammals becoming well preserved in the matrix in which they perished; the colossal mammals becoming mired by their own weight;—all these various conditions were favorable for the preservation of those remains which are found in the greatest abundance.

The arboreal ancestors of man, on the other hand, left their remains strewn on the forest-floor, or weathering in rude tree-nests, the most uncertain of all places for their final preservation.

Professor Marsh, in his magnificent monograph on the extinct fossil toothed birds of North America, testifies that fossil birds are of the rarest occurrence, and to their arboreal habits may be due their rarity; the remains of aquatic birds being always more common.

Even if early man and his progenitors sought shelter in caverns, Professor Dawkins, the distinguished British archæologist, shows that while there have probably been caverns in all geological periods, they have all been obliterated by "the rain, the alternation of heat and cold, the acids evolved from decaying vegetation, and the breakers on the sea-shore," and this obliteration has been so thoroughly accomplished that there are only two caverns known that can be said to be as old as the middle pliocene.

Without entering into any discussion regarding the submergence of the coast-line in many parts of the world, and its subsequent erosion, thus removing traces of ancient people who have sought the sea for food, we may accept the evidences

offered to show that paleolithic man came from the south, for he makes his appearance along the southern borders of the northern ice-sheet.

It is a significant fact that, with the appearance of the glacial fields, the later tertiary apes were driven out of Europe, never to return, whilst paleolithic man came in, and was able to endure the very influences that caused the disappearance of the apes. This shows how vast a change had taken place at that early time between man and his anthropoid relatives.

He came from the south, from those regions where the least exploration has been carried on, and where the difficulties are generally greatest for such explorations. It is also in the equatorial regions that we have the hypothetical Lemuria, Atlantis, and other submerged areas, which were generally supposed to have been lands teeming with life.

An argument for believing that he lived in the earlier tertiaries may be found in the fact that his characters, as seen in the earliest remains, are yet promptly recognized as human. It is true they depart somewhat from the characters which distinguish the race to-day, nevertheless the race, with its wide variations, can compass, without violence, the most aberrant form yet found. It is man that is recognized, and not ape, and that man could have lived through such long ages with so little change is an argument that his progenitors must have lived long anterior to the earliest traces yet found.

If we consider the minor subdivisions of man in time since the neolithic age, we can trace some of his incursions. We can, as it were, see him coming from some unknown quarter, and frequenting regions never before inhabited by him.

If we now look at civilized man, we find him distributed in every part of the world, and history and tradition in most cases give us information as to the manner of this distribution. Believing that in past times as at present, colonizing went on in similar ways, we infer that neolithic man became more widely scattered than his predecessors. Wherever we turn our eyes, from one side of the earth to the other, the age of polished stone implements at one time existed. More important still is it to consider that paleolithic man seems to be just as widely distributed. His remains in river-drift and other places have been found in England, France, Portugal, Greece, Italy, Africa, Palestine, the Indian Peninsula and Northern India, New Jersey,

and California. Thus we have this early man spread over nearly the whole world; and, so far as we can judge from his rude implements, identical under all conditions of climate and surroundings. Surely such a distribution must not only indicate an enormous lapse of time, during which he remained in this condition, and slowly found his way to different parts of the world, but must, of necessity, presuppose the existence of a more primitive people from which these had sprung. Had these also become so widely scattered? Compare these rude men with those of Europe, and consider how long a knowledge of the Western Hemisphere was hidden from the latter. How infinitely slow must have been the colonizing of continents in paleolithic ages and in ages more remote!

These considerations, in regard to the not improbable existence of man in the middle, and, possibly, in the earlier tertiaries, are offered that the reader may be better prepared to appreciate the remarkable discoveries of the remains of man in the auriferous gravels of California. An elaborate memoir on this subject, by Professor J. D. Whitney, has just been completed in a second part, forming one of the publications of the Museum of Comparative Zoölogy at Cambridge.

Professor Whitney, formerly the director of the geological survey of California, has, in the memoir referred to above, described at great length the evidences regarding the genuineness of the famous "Calaveras skull," repudiated as a hoax by the press generally, made doubly famous by the witty verses of Bret Harte, and looked at with suspicion or ignored by archæologists of great repute. The reader must be referred to the pages of Professor Whitney's memoir to appreciate the force of the evidences he there brings forward in support of the claims he has made regarding the genuineness of the occurrence of human remains from beds of pliocene and possibly of miocene age. Were this skull the only object of this nature that had been found in the auriferous gravels, one might perhaps be justified in questioning it.

The truth is, however, that in ten different counties in that great region, remains of man, associated with extinct mammals and buried at great depths in the auriferous gravels, have been brought to light. It is true that in many cases the evidences have been produced by miners, but among that class are many intelligent men. In their vocation, too, they are specially seeking for

definite objects, namely: particles of gold. Their experience is not like that attending the rough excavations of railroad cuts or canals. Their work has been accompanied by a scrutiny which adds positive weight to their statements. Of great importance, too, is the uniformity of their testimony, as Professor Whitney points out, and the invariably rude character of the implements which they produce from these beds. Any attempt at deception would certainly bring with it some rudely carved image, or stone with rude characters engraved thereon. No collusion is conceivable between so many observers, covering so many years, and working in so many widely separated localities.

Among the many notable examples cited by Professor Whitney, that of the occurrence of human remains beneath Table Mountain is the most remarkable. In this case, tunnels had been driven in horizontally beneath the basaltic cap of the mountain, which is of great thickness. The tunnels being horizontal, there was no possibility of *débris* falling from above, with the chance of conveying surface specimens. The great age of the gravels beneath Table Mountain is shown by the profound geological changes which have taken place in the surface features of that region since the volcanic outflow formed the almost imperishable cap, which has preserved this area and similar areas from the wide denudation that has taken place around. The basalt forming the cap of Table Mountain extends in an even plateau, though interrupted by deep gorges and cañons, for a distance of twenty miles, with a descending grade, as measured by barometric observations, of about eighty feet to the mile. It is inconceivable on any hypothesis that this ancient lava-flow could have followed any mountain ridge or spur. Indeed, all the evidence goes to show that it followed an old river-bottom, with its superimposed beds of gravel and horizontally deposited layers of sand and clay.

While this lava-stream formerly occupied a river-channel, presumably depressed below the surrounding country, now this consolidated mass stands far above the deep gorges and cañons that have been furrowed out since. In other words, this region, once a valley, is now in turn a mountain! The enduring nature of the basalt has partially protected these plateaus from the universal erosion of that area. Beneath this basaltic mountain tunnels have been run, in one case to a distance of nearly a third of a mile.

The old river-bed upon which Table Mountain rests has been found, with its characteristic worn pebbles and bowlders, and gold has been got in precisely such positions as it would be found to-day in existing rivers. And from these tunnels, even from one which measured nearly a third of a mile in length, the remains of man in the shape of his actual bones, as well as beads, rough pestles, and other relics of human fabrication, have been brought to light, and these discoveries have been made, not by one man, but by many. Their sworn statements are given, and the specimens collected by different people, at different times, now enrich the collections of the California Academy of Natural Sciences, the Philadelphia Academy of Natural Sciences, and the Museum of the Boston Society of Natural History.

In regard to the famous skull itself, we can do no better than to quote from Professor Whitney's preface to Part II., wherein he says that "all those who refuse to accept my conclusions as to the great antiquity of man in California, do so on the ground that the Calaveras skull was not taken from its bed by the hand of a scientific man. In so doing, they not only ignore the evidence presented by the skull itself, which is positively a fossil, and was chiseled out of its gravelly matrix in the presence of several eminent authorities, but they also reject the very full testimony from other quarters, some of which comes from men of education, and even of professional education. The body of the other evidence is so great that it does not appear to me that it would be materially weakened by dropping that furnished by the Calaveras skull itself."

The voluminous testimony offered by Professor Whitney will impress all who read his volume dispassionately.

In regard to the age of these remains, Professor Whitney says that "it will be safe to say that the human race in America is shown to be, at least, of as ancient a date as that of the European pliocene; and to have an idea how far that epoch is from the present one, it is only necessary to recall the amount of erosion which has taken place since the cessation of volcanic activity in that part of the sierra in which lie the formations which have been described in the present volume."

Whatever age geologists may ascribe to the auriferous gravels, sufficient proof, in our mind, has been adduced to show that man lived at the time of their deposition, and that the mammals and

plants then living are now extinct. The plants, according to Lesquereux, are of pliocene age, and some identical with, or closely allied to, miocene forms.

On the eastern coast of North America, we have the important discovery, by Dr. C. C. Abbott, of true river-drift implements in the Delaware Valley of New Jersey. From the testimony of eminent geologists, the Trenton gravels were deposited at the foot of the retreating ice-sheet. In the Tenth and Eleventh Annual Reports of the Peabody Museum of American Archæology and Ethnology, Dr. Abbott has published full accounts of his discoveries. The implements were obtained from depths ranging from five to ten feet below the surface. These are precisely of the same nature as those characterizing the river-drift men of Europe. If Dr. Abbott's conclusions are correct, then the gravel-beds in question are a part, so to speak, of the glacial epoch.

That man existed contemporaneously with their deposition, there can be no doubt.*

The probable relation of the paleolithic man of Europe with the Esquimaux of North America has been suggested by Professor Dawkins, and Dr. Abbott supports this supposition with other evidences. In this connection, it is interesting to remark that while the breadth of the Calaveras skull, according to Professor Wyman, agrees with the other crania from California, except that of the Digger Indian, it differs in dimensions from other crania, and in these differences it approaches the Esquimaux.

The wide distribution of these remains, from distant India throughout Europe and across the American continent, shows a race, judging from their implements, apparently homogeneous, and indicates an immense lapse of time for the dispersion of these people. Their precursors must be recognized by their bones, for implements to be distinguished from ordinary stones are not to be expected. The improbability of encountering these remains has already been pointed out.

If man has descended from some ape-like progenitor, or,

* If the views of Mr. Henry C. Lewis regarding the Trenton gravels are correct, then their connection and superposition on the red gravel and brick clays indicate a second and much later glacial period, corresponding to the reindeer period in Europe. Whatever the facts may show, the identity of the Trenton river implements with those of the river-drift of Europe seems well established.

rather, if he and the present apes are derived from a common ancestor, then we must expect to find the early remains of man closely drawing near, in his characters, to that hypothetical form which is looked for in "the missing link." Thus far all the characters of the early remains of man point distinctly in that way, though many a long gap must yet be filled before the sharp lines of demarkation between the higher groups break down. From the exceeding rarity of the remains of the order of primates, the different groups stand quite as isolated as man from them. Not to speak of the gaps yet to fill between the different genera of the higher apes, a great gap separates the true apes from the half-apes or lemurs, and these in turn have affinities with the most aberrant and puzzling forms, like the aye-aye and tarsier, with its extraordinary long tarsal segment, so that we have the affinities of man brought by a quick passage, as it were, to the lower levels of the mammalia; and in this connection it is interesting to observe that in the lower eocene, both in Europe and America, lemuroid forms have been discovered.

In recalling the low characters of ancient man, it is not necessary to mention here the oft-repeated examples of the Neanderthal and Engis skulls, the skulls of Perigord, the jaws of La Naulette, Moulin Quignon, and a host of other examples now classic in the literature of the subject, and the equally remarkable remains in this country, such as the platycnemic tibiæ of Michigan, and the remarkable skull from that region, with the temporal ridges nearly approximating. Suffice it to say that, just as we find the remains of man at lower levels, so do we find his characters in the main departing not only from the higher races of to-day, but in the same proportion approaching a type which is ape-like. If we examine the races to-day we find the savage groups presenting a number of low characters, such as a deficiency of the sharp ridge at the base of the nostrils, differences in the proportion of the pelvis, in some the foramen magnum farther back; a certain percentage of perforated humeri, prognathism, and other characters, all of which are an approach to the apes, and a departure from higher man. No one savage race possesses all these characters, but each race has some of them. If we look for these characters among the higher races, we meet with them rarely. Thus, the percentage of perforated humeri in the white race is very low. Of fifty-

two humeri examined by Wyman, only two were perforated. In the present Indian and Negro, this peculiarity occurs more frequently, and in the prehistoric races of America it is very common. Wyman found in a Florida mound thirty-one per cent. perforated, while Gillman estimated the percentage of perforated humeri in a Michigan mound as at least fifty per cent. He has furthermore pointed out the interesting fact that these low humeri are associated with excessively flattened tibiæ.

If now we note successively the percentage of low characters revealed in the higher races of to-day, in existing savages, in the races, both savage and civilized, at the dawn of history, and finally, in those savage races which alone existed in neolithic and down through to paleolithic times, we find this percentage becoming greater as we descend. So marked is the increase that one may almost predict that, when still more remote horizons yield their human remains, an enormous percentage, if not all, will be found with low, receding foreheads; heavy frontal crests; rounding of the base of the nostrils; a nearer approximation of the temporal ridges; a greater posterior position of the foramen magnum; the absence of a projecting chin; ape-like proportions of the molar teeth; perforated humeri; quadrumanous proportions of the pelvis; flattened and saber-like tibia; conspicuous roughness and ridges for the attachments of muscles, and other low osteological characters, all pointing in one direction. Of the soft parts, the amount of hairiness and the racial character of the hair, the persistence of ape-like muscles, which at the present time occur but rarely, or of their habits and mental attributes, nothing, of course, can be known.

These characters, when found, will have become merged so completely with those of the ancestors on another line that new genera will have to be erected to embrace them. This conclusion brings no strain upon the accepted methods of logical deduction. For these remains we are still seeking.

There are many species of mammals whose early progenitors are not known, and, though many wide and important gaps in conspicuous groups of mammals have been filled up, thanks to the labors of our American paleontologists, there are many "missing links" in other groups as well as in that group to which we belong. The intense impatience to fill this gap in man's genealogy arises from the special interest that man naturally feels in his own species. How long we have patiently waited

for those links which Geoffroy St. Hilaire so earnestly looked for—the closing up of wide gaps between the paleotherium, hipparion, and the horse; and who could have foretold in his day that, in the wild regions far beyond the Mississippi, amid hostile savages, these precious remains would be brought to light!

Many other intermediate forms, of equal importance in forming connected series, though not so well known to the public, have been discovered by Leidy, Marsh, and Cope. Indeed, such intermediate and generalized forms have been added to the mammalia that we have creatures combining the characters of the pigs and ruminants, animals possessing the characters of the hoofed beasts, carnivora, and rodents! Professor Flower, the distinguished English osteologist, confesses that the modern classification of mammals completely breaks down in the light of these revelations. Cuvier's law of the "Correlation of Structures," although applicable within certain limits, would have led him into the gravest errors as applied to the fossils known at present. Professor Marsh, in his address on the "History and Methods of Paleontological Discovery," says that if Cuvier "had had before him the disconnected fragments of an eocene tillodont, he would undoubtedly have referred a molar tooth to one of his pachyderms, an incisor tooth to a rodent, and a claw-bone to a carnivore."

The sharp lines of demarkation which discriminate the various groups of mammals in Cuvier's day have been, in many cases, rounded off or completely obliterated. Man, who is still seeking his own phylum with those of many other species of mammals, must patiently wait.

Huxley, in his courageous little book on "Man's Place in Nature," published nearly twenty years ago, closes by asking the question: "Where, then, must we look for primitive man? Was the oldest *Homo sapiens* pliocene or miocene, or yet more ancient? In still older strata do the fossilized bones of an ape more anthropoid, or a man more pithecoid, than any yet known, await the researches of some unborn paleontologist? Time will show; but, in the meanwhile, if any form of the doctrine of progressive development is correct, we must extend, by long epochs, the most liberal estimate that has yet been made of the antiquity of man."

EDWARD S. MORSE.